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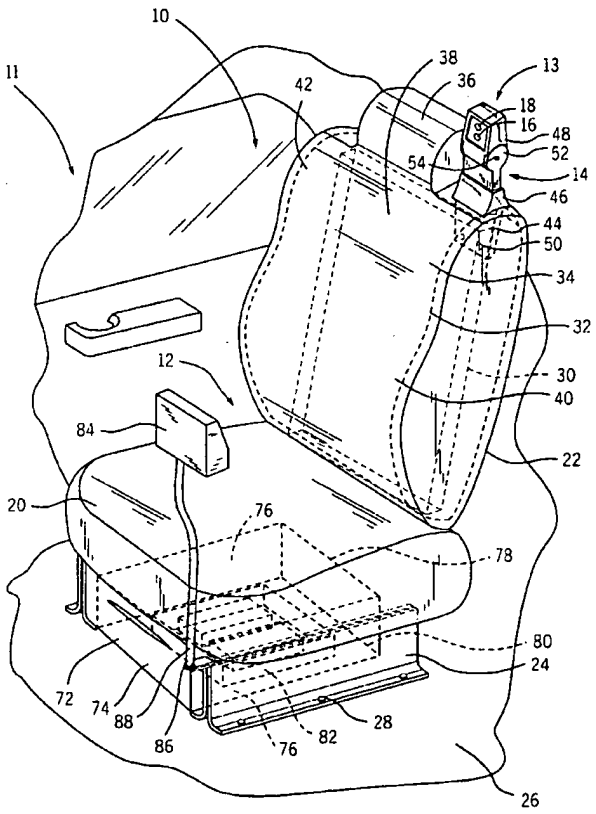
(54) Title: LIGHT PROJECTING AND RECEIVING SYSTEM

(57) Abstract: A light projecting system for use in a vehicle comprising a seat and a light projecting device fixedly attached to the seat.



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LIGHT PROJECTING AND RECEIVING SYSTEM

TECHNICAL FIELD

The present invention relates to an apparatus for mounting image receiving and projecting devices in motor vehicles. More particularly, the present invention relates to an apparatus for the support and positioning of video cameras and light projecting sources incorporated into the seats of motor vehicles.

BACKGROUND OF THE INVENTION

In recent years, military, taxis, private persons, police and private detectives have added video cameras to their equipment list for video recording of activities, persons, races, passing scenes, patrols and investigations. For police particularly, the video camera provides a visual record of events such as traffic stops, chases, and other incidents of law enforcement. Private detectives also record incidents for evidentiary purposes during investigations.

Various devices have been provided for supporting video cameras in motor vehicles. Stationary investigations allow use of tripods mounted in the motor vehicle to support the video cameras. The tripod readily stands in many vans or other trucks which have room for the legs to spread and thereby provide a stable foundation for using a video camera attached thereto. Tripods however are not readily adaptable for use in passenger vehicles which have limited space in the rear seat portion of the car. Generally, the legs are insufficiently separated for image recording stability.

For military, taxi, and police vehicles particularly, video cameras typically mount on U-shaped brackets attached to the forward portion of the roof adjacent the windshield. The bracket receives the video camera for a forward view through the windshield in order to provide a record of traffic stops, automobile chases, and the like. Other camera mounts have been used to secure video or television cameras within automobiles, such as race cars to provide a driver's perspective during an automobile race being broadcasted on television. One known device for mounting a camera in a car

maintains the camera level with respect to the roads surface regardless of acceleration or gravitational forces. The camera is supported on a pendulum suspended from a gimble and constrained with spring and damping elements which match the vehicle suspension system in order to produce equal and opposite rotations of the pendulum in response to the movements of the vehicle.

Other devices are less complicated. One such device mounts a camera in a protective box which attaches to the rear deck of the vehicle near the back window. Telescoping members connect the box to the rear deck. Coil springs absorb shock in order to dampen vibrations communicated to the camera. Another device provides a channel member with a depending plate at one end. The plate is received in a slot of an upper edge of a car seat which normally receives a tongue or support member of a headrest. A distal end of the channel rests on top of the dashboard of the vehicle. A camera mounts with a bolt through an opening in the channel. An elastic hold-down and stabilizing cord is used to secure the distal end of the channel to the dashboard.

My U.S. Patent No. 5,833,101 discloses a transverse bar which connects at opposing distal ends to the headrest supports in the seats of motor vehicles. The video camera mounts to a pivotable support attached to the transverse bar, whereby the camera may be oriented at a selected angle for recording.

While these devices have generally functioned to support a camera within a car, there are drawbacks to their use. Mounting the camera on a rear deck of a car does not satisfactorily show dashboard information which is useful and important during automobile races. Also this perspective view differs from that seen by the driver. On the other hand, placing the camera closer to the windshield may have the camera too far forward to show the dashboard of the car. Further, such brackets that mount to the seat slot for headrest supports occupies one of the headrests and takes the space otherwise occupied by a passenger. Also, surveillance security and other police activities need the camera to be less visible from casual observation, which the present devices do not provide.

Further, while some video cameras incorporate a recording apparatus within the camera, often, the recorder is a separate component connected to the video camera by communication cables. As a separate component, the recorder is usually permanently mounted to a portion of the wall of the trunk of the motor vehicle. This makes access to the recorder and tapes cumbersome, time consuming, and unsatisfactory. Space within a

police vehicle however is at premium for storage of equipment and materials. The video recorder needs to be secure so that it is not independently moving while the vehicle is traveling, yet must be readily and easily accessible for retrieval and exchange of recording tapes. Accordingly, there is a need in the art for improved mounts for video recording equipment in motor vehicles.

Systems for projecting images onto a reflective surface, which then reflects the images to an observer who sees a virtual image overlapped with outside scenery viewed through a windshield are well known within the art. These systems are commonly referred to as heads up display systems, and generally include at least one projector and a reflector. The projector receives a signal from some type of source, whether it be a video recording device, a device for measuring the speed of a vehicle, or numerous other possible devices, and transforms the signal into beams of light that it projects onto the reflector. The reflector, sometimes referred to as a combiner, then receives these light beams and reflects them to an observer.

When the heads up display system is used in motor vehicles, the reflectors are normally located in front of the driver and positioned so that no obstructions block the reflected light beams as they travel from the reflector to the driver. The projectors can be located in various places within the motor vehicle, and do not necessarily have to project the light beams directly onto the reflector. One common place to locate a projector is in the dash board. However, due to space concerns, positioning the projector so that it projects its light beams directly onto the reflector is not always feasible. In these situations, mirrors are used to direct the light beams onto the reflector. The ceiling of the motor vehicle is another known place to mount a projector. This is often advantageous because it does not require positioning the projector in an already crowded dashboard and it allows the light beams to be projected directly onto the reflector.

Although mounting a projector to the ceiling of a motor vehicle has its advantages, it also creates a potential problem. In most vehicles, devices such as dome lights, maps lights, temperature control panels, direction sensing and displaying apparatuses, information displays, keyless entry signal receivers, and even video monitors are mounted to the ceiling of the vehicle. Often times, the placement of these devices on the ceiling conflicts with the desired placement of the projector. Accordingly, there is a need in the art for a mount for a projector that shares the advantages of a ceiling mount, but

does not conflict with the placement and use of other devices. The present invention is directed to the simultaneous fulfillment of both the needs addressed above.

BRIEF SUMMARY OF THE INVENTION

The present invention is directed to a light projecting and receiving system for use in a vehicle having a seat, a mounting apparatus attached to the seat, a light receiving device mounted to the mounting apparatus, and a light projecting device mounted to the mounting apparatus.

The present invention is also directed to a mounting apparatus for attachment to a seat in a vehicle having a support member with a first end that is attached to the seat and a housing that is attached to the second end of the support member. The housing is such that a light receiving device and a light projecting device can be mounted thereto.

The present invention is also directed to a light projecting system for use in a vehicle having a seat and a light projecting device fixedly attached to the seat.

The present invention is also directed to the method of forming a virtual image in the line of sight of a vehicle passenger comprising the steps of electrically creating a representation of an image, passing light through the representation to create a projected virtual image, and projecting the projected virtual image from a projector mounted to a vehicle seat.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view showing the light projecting and receiving system.

Figure 2 is a perspective view showing the mounting apparatus and its component parts.

Figure 3 is a side elevational view showing the light projecting and receiving system in a vehicle.

Figure 4 is a front elevational view showing the light projecting and receiving system in a vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 illustrates in perspective view a light projecting and receiving system 10. Light projecting and receiving system 10 is made up of a seat 12 and a light projecting and receiving apparatus 13. Seat 12 is a conventional seat that may be one of a wide variety of seats that are well known in the art. Seat 12 is made up of a seat rest 20 and a seat back 22. Seat rest 20 is a substantially horizontal member that is rigidly attached to the floor of a motor vehicle 11 by two support legs 24, which are bolted to the vehicle floor 26 by bolts 28. Other means of attaching the support legs 24 to vehicle floor 26 that are known in the art, such as by rivets or welding, may also be used. Seat back 22 rotatably couples to seat rest 20 by methods that are well known and within the skill in the art. Seat back 22 is an upright member that includes a frame 30, a foam core 32, and a covering 34. Frame 30 provides the support for seat back 22 and may be configured in a number of ways and made from materials well known in the art. Foam core 32 surrounds frame 30 and provides the cushioning and contours desired in seat 12. Covering 34 surrounds and encloses foam core 32, and may be made of a variety of different materials well known within the art. A headrest 36 is formed at the top of seat back 22 from an extension of foam core 32. Although shown as a protruding member of seat back 22, headrest 36 may also be a separate member that is attached to seat back 22 by well known methods.

For reference, seat back 22 is divided into three portions. A middle portion 38 is defined as including headrest 36 and the portion of seat back 22 that is directly below headrest 36. The remaining two portions include the volumes of seat back 22 that are on both sides of middle portion 38. Of the remaining two portions, an inner portion 40 is defined as the portion of seat back 22 that is closest to the lateral center of motor vehicle 11. An outer portion 42 is then defined as the last portion, which is that portion of seat back 22 that is farthest away from the lateral center of motor vehicle 11. For seats that do not include a headrest, the seat back is divided into three roughly equal portions, with the portion that is closest to the lateral center of the vehicle being defined as the inner portion, the next closest portion being defined as the middle portion, and the farthest being defined as the outer portion. In the preferred embodiment, mounting apparatus 14 extends upwardly out of the inner portion 40 of seat back 22. In the case of bench seats, or seats

that seat more than one person, the seat is considered to be made up of smaller seats corresponding to where passengers would normally sit in the seat. For example, a seat that would normally seat three people is considered to be made up of three smaller seats, with each smaller seat corresponding to where each person would normally sit. Accordingly, each smaller seat includes an inner portion, a middle portion, and an outer portion.

Referring now to Figures 1 and 2, light projecting and receiving apparatus 13 consists of a mounting apparatus 14, a light projecting device 16, and a light receiving device 18. Mounting apparatus 14, which is also called a parrot, is made up of a support member 44, a support member cover 46, and a housing 48. Support member 44 is an elongated rigid member that is made from metal, plastic, or any other sufficiently rigid material. A first end of support member 44 is attached to frame 30 by an attachment means. In the embodiment shown in Figure 1, fasteners, shown as bolts 50, are directed through holes in support member 44 and through co-axial holes in frame 30. The holes in frame 30 are threaded to engage the bolts 50, or alternatively, each bolt 50 extends through frame 30 and is engaged by a nut. In other embodiments, support member 44 is connected to frame 30 by various other methods that are well known in the art, such as by rivets or welding. In yet another embodiment, support member 44 may be an extension of frame 30. In still another embodiment, support member 44 is not attached to frame 30 but instead is attached to some other portion of seat 12. In one embodiment, an adhesive is used to attach support member 44 to covering 34. Although support member 44 is shown attached to the front passenger seat in motor vehicle 11, in alternative embodiments it may be attached to any seat in motor vehicle 11, including the driver's seat and the rear seat or seats.

The second end of support member 44 is made up of two spaced apart parallel mounting extensions 52 that extend from opposite sides of support member 44. Each mounting extension 52 has a hole 54 bored through it such that the holes of both mounting extensions 52 share the same horizontal axis, which runs laterally across the vehicle. In the preferred embodiment, mounting extensions 52 are circular in shape. In alternative embodiments, mounting extensions 52 may be of various shapes and sizes. In yet another alternative embodiment, there are no mounting extensions. Support member cover 46 is an appearance enhancing structure that slides over support member 44 to cover the hole in covering 34 through which support member 44 extends. Support member cover 46 includes an aperture 56 that is of a similar shape to the cross-section of support member

44 and that is slightly larger to allow support member 44 to slide through it. Since support member cover 46 is an appearance enhancing element, it can be a wide variety of shapes and colors, and can be made of various materials. Support member cover 46 can also be excluded from light projecting and receiving system 10 without negatively affecting its operation.

Housing 48 is connected to the second end of support member 44 between the two mounting extensions 52 by a second attachment means. In one embodiment, the means for attaching housing 48 to support member 44 includes a hole that extends through housing 48 and that is coaxial to the holes in mounting extensions 52. This arrangement allows a fastener, such as a bolt 58, or a pin to extend through housing 48 and mountings extensions 52, thereby securing housing 48 to support member 44. Housing 48 rotates around the axis of the hole that is bored through it, thereby allowing housing 48 to tip forward or to tip backward around the axis. Housing 48 is locked into position by tightening bolt 58. In an alternative embodiment, the hole does not extend all the way through the housing. Instead, a tapped hole extends partially into housing 48 from each side of the housing along the same axis. A screw passes through each mounting extension 52 and into the tapped hole on either side of housing 48. Rotation of housing 48 around the axis of the tapped holes is accomplished by loosening the screws. In yet another embodiment, housing 48 is mounted to a swivel device, which is then mounted to the second end of support member 44. The swivel device allows housing 48 to rotate around a substantially vertical axis, which allows the housing to be rotated from side to side thereby allowing a once forward facing surface of housing 48 to be positioned so that is faces the rear of the vehicle. In another embodiment, housing 48 is bolted directly to support member 44. There are a multitude of other well known means of attaching support member 44 to housing 48 that could be used as well. The embodiments described above are intended to be examples and should not be construed as limiting the means of attachment to only those embodiments.

Housing 48 is a substantially rectangular box, having four upstanding sides and two sides that are substantially perpendicular to the upstanding sides, defining an internal volume. Housing 48 includes a mounting plate 60 and an aperture 62. Mounting plate 60 is defined by a flat surface that is substantially orthogonal to the four upstanding sides of housing 48. Aperture 62 is a hole in the front side wall of housing 48 that allows

entry into and exit out of the internal cavity of housing 48. Mounting plate 60 provides a surface on which to mount various video equipment, such as light receiving device 18 and light projecting device 16, while aperture 62 allows the video equipment to extend out of the housing, or alternatively, allows light received by or projected from the various video equipment to enter and exit the housing. In one embodiment, aperture 62 is left open. In another embodiment, a transparent window may be fitted within or over aperture 62 to prevent debris from entering the interior of the housing, or to prevent tampering with the video equipment. In alternative embodiments, housing 48 may be one of a number of different shapes and configurations. In one such embodiment, housing 48 is essentially comprised of only a mounting plate that is not enclosed by side panels. In this embodiment, an aperture is not needed.

Referring to Figure 4, in the preferred embodiment, support member 44 extends from frame 30 through foam core 32 and out of covering 34 of inner portion 40 of seat back 22 so that housing 48 is positioned lateral of headrest 36 above inner portion 40 of seat back 22. Housing 48 may be positioned at various heights above or below headrest 36, and may also be positioned in front of or behind headrest 36. Essentially, in the preferred embodiment, housing 48 is positioned anywhere within a substantially rectangular area 64 that is defined on each side by an extension of a line drawn between inner portion 40 and middle portion 38 of each seat back, on the top by the ceiling 66 of motor vehicle 11, and on the bottom by a line drawn between the two seats just above where the shoulders of an average passenger in vehicle 11 would be located if the average passenger were seated in each seat. Within area 64, housing 48 can be moved forward or rearward as desired. In alternative embodiments, housing 48 is positioned outside of preferred area 64. For example, housing 48 may be positioned lateral of headrest 36, but above outer portion 42 of seat back 22 rather than inner portion 40. Alternatively, housing 48 may by positioned in the area between the two seats, but below the line defining the bottom of preferred area 64.

Referring to Figures 2, 3, and 4, a light receiving device 18 and a light projecting device 16 are mounted to mounting plate 60 within the housing. Light receiving devices are well known in the art, and may be of many different varieties. One example of light receiving device 18 is a video camera 18a. The use and operation of video cameras is well known and requires no further discussion.

As shown in Figure 3, in one embodiment, light receiving device 18 transmits a signal to a signal receiving device 67a via wiring 71 connecting the two, which may be factory installed in motor vehicle 11 or which may have to be installed along with light receiving device 18. In an alternative embodiment, the signal may be transmitted from light receiving device 18 and received by signal receiving device 67a via any wireless communication. One embodiment of wireless communication utilizes infrared light 73 to transmit the signal from light receiving device 18 to signal receiving device 67a. The use of infrared light 73 to transmit the signal is well known within the art and requires no further discussion. Other wireless communication systems are well known within the art and may also be used, including radio frequency (RF) signals 73a. The use of wireless communication between signal receiving device 67a and light receiving device 18 eliminates the need to install wiring between signal receiving device 67a and light receiving device 18, and as a result facilitates installation of light projecting and receiving system 10. Use of wireless communication also allows signal receiving device 67a to receive signals from light receiving device 18 from various locations both inside and outside of motor vehicle 11.

Similarly, light projecting devices are well known to one skilled in the art. There are a variety of different light projecting devices for a variety of different purposes. In the preferred embodiment, light projecting device 16 is a projector 16a, or what is also referred to in the art as a display unit, and is used in combination with a combiner 68, disclosed in U.S. Patent No. 5,519,410, to form a heads-up display. A heads-up display is a display system in which an image is projected from projector 16a onto a reflecting device (shown as combiner 68), which then reflects the image to an observer, who sees a virtual image 70 overlapped with outside scenery viewed through windshield 69. Combiner 68 is usually placed in front of the driver vehicle 11, but in alternative embodiments may be placed at various locations in vehicle 11, such as behind the driver in his or her line of vision out of the rear window of the vehicle through a rear view mirror. The images displayed by heads-up display systems can vary. For example, in an automobile, the heads-up display my display the speed of the vehicle, the revolution frequency of the engine, the time, turn signals, and other various alarm devices. The operation of projector 16a and combiner 68 and the incorporation of a heads-up display into a vehicle are also well known within the art and require no further explanation. In an alternative embodiment, projector

16a is used to project an image to a reflecting device other than combiner 68, such as windshield 69. In other alternative embodiments, projector 16a is one of a wide variety of projectors that are used for various purposes that are well known to one skilled in the art.

As shown in Figure 3, in one embodiment, projector 16a receives the signal from signal generating source 67 via wiring 71 connecting the two, which may be factory installed in motor vehicle 11 or which may have to be installed along with projector 16a. In an alternative embodiment, the signal may be transmitted from signal generating source 67 and received by projector 16a via any wireless communication. One embodiment of wireless communication utilizes infrared light 73 to transmit the signal from signal generating source 67 to projector 16a. The use of infrared light 73 to transmit the signal is well known within the art and requires no further discussion. Other wireless communication systems are well known within the art and may also be used, including radio frequency (RF) signals 73a. The use of wireless communication between signal generating source 67 and projector 16a eliminates the need to install wiring between signal generating source 67 and projector 16a, and as a result facilitates installation of light projecting and receiving system 10. Use of wireless communication also allows signal generating source 67 to transmit signals to projector 16a from various locations both inside and outside of motor vehicle 11.

Light receiving device 18 and light projecting device 16 can be mounted to housing 48 using various mounting means. In one embodiment, a screw passes through a hole in mounting plate 60 and engages with a threaded hole in the bottom of light receiving device 18 or light projecting device 16. In another embodiment, a strap is wrapped around light receiving device 18 or light projecting device 16 and is then attached to mounting plate 60 in order to secure the light receiving device 18 or light projecting device 16 to mounting plate 60. In yet another alternative embodiment, housing 48 includes mounting tabs rather than a mounting plate, which extend toward the inside of housing 48 from the side walls, to which the light receiving device 18 or light projecting device 16 are securely mounted. In other alternative embodiments, housing 48 is specially adapted to house a particular combination of light receiving device 18 and light projecting device 16. In the preferred embodiment, the light receiving device 18 and the light projecting device 16 are mounted side-by-side, with one closer to the lateral center of vehicle 11 than the other. In

another embodiment, shown in Figure 4, the light receiving device 18 and the light projecting device 16 are mounted with one on top of the other.

Referring back to Figure 1, a sliding drawer 72 is slideably coupled to seat rest 20. Sliding drawer 72 contains a front panel 74, two side panels 76, a back panel 78, a bottom panel 80, and a recorder 82. Front panel 74 is positioned below and aligned with the front edge surface of seat rest 20 to form the appearance of a smooth transition from the front edge of seat rest 20 to front panel 74. An indented cavity that forms a handle is positioned on the forward facing surface of front panel 74. Side panels 76 are upstanding elongated members, which are parallel and spaced apart, that are orthogonally connected to front panel 74. A first channel is attached, such a by bolts, to the outside of each side panel 76. A mating second channel is attached, such a by bolts, to the inside of each support leg 24 and engages the first channel whereby the engagement allows side panels 76 to slide into and out of seat rest 20. A back panel 78 extends orthogonally between and connects the two side panels 76. Bottom panel 80 is connected to the bottom edge of front panel 74, side panels 76, and back panel 78, and thereby defines the bottom of sliding drawer 72. Recorder 82, for receiving and recording a signal from light receiving device 18, is connected, preferably by bolts, to bottom panel 80. In an alternative embodiment, a metal or plastic shield is hinged to one of side panels 76 and folds over recorder 82 to engage the opposing side panel 76, thereby preventing spilled liquids from entering recorder 82. A locking device could also be added to the shield to prevent tampering with recorder 82. Sliding drawer 72 and recorder 82 are optionally included in light projecting and receiving system 10, and therefore are not required components. A more thorough description of sliding drawer 72 is disclosed in applicant's application serial number 09/398,910, which is incorporated by reference herein.

Light projecting and receiving system 10 also includes controller 84. Controller 84 refers to the remote operation and monitoring apparatus disclosed in applicant's application serial number 09/353,113, which is incorporated by reference herein. Controller 84 allows an operator to control the operation of light receiving device 18 from a remote location. Controller 84 also provides a video display to monitor the operation of light receiving device 18. Bracket 86 rigidly extends from support leg 24 toward the front of seat 12. A first end of a support column 88 is connected to bracket 86. The second end of support column 88 is connected to and supports controller 84. Support

column 88 is a hollow, flexible tube that allows an operator to position controller 84 in the desired position within the range of movement of support column 88.

A light projecting system may be utilized as an alternative to light projecting and receiving system 10. The light projecting system is comprised of the same components included within light projecting and receiving system 10, minus light receiving device 18.

The incorporation of mounting apparatus 14, or parrot, into light projecting and receiving system 10 provides the system with several distinct advantages. One advantage is that the system can be incorporated into any vehicle that has a seat, and can be done without significantly hampering the use and operation of other vehicle devices and without necessitating the removal or repositioning of these devices. Another advantage of the system is that the parrot is positioned in an area of the vehicle that is generally not utilized and that is out of the way of the vehicle passengers. Another advantage of the system is that the parrot can easily be placed near the lateral center of the vehicle so that rolling of the vehicle does not significantly affect the operation of a light receiving device mounted in the parrot. The system is also advantageous in that the parrot can be adjusted so that the light receiving and projecting devices face in almost any direction, including forward and backward. Yet another advantage of the system is that it does not significantly obstruct the view of the passengers, whether they are in the front seat looking rearward through the rear view mirror or in the back seat looking forward. Another advantage of the system is that it is safe during a collision.

Although the present invention has been described with reference to preferred embodiments and several alternative embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. The present invention described with reference to the preferred and alternative embodiments and set forth in the following claims is manifestly intended to be as broad as possible. For example, unless specifically noted otherwise, the claims reciting a single particular element also encompass a plurality of such particular elements.

CLAIMS

What is claimed is:

1. A light projecting and receiving system for use in a vehicle comprising:

a) a seat;

b) a mounting apparatus attached to the seat;

c) a light receiving device mounted to the mounting apparatus; and

d) a light projecting device mounted to the mounting apparatus.

2. The light projecting and receiving system of claim 1 further comprising a controller for the remote operation of at least one of the light projecting device and the light receiving device.

3. The light projecting and receiving system of claim 1 further comprising a recorder for receiving and recording a signal generated from the light receiving device.

4. The light projecting and receiving system of claim 1 wherein the light projecting device is a projector for use in a heads-up display system.

5. The light projecting and receiving system of claim 4 further comprising an optical combiner for the reflection to an observer of the light projected from the projector.

6. The light projecting and receiving system of claim 1 further including a signal generating source wherein the signal generating source transmits signals to the light projecting device.

7. The light projecting and receiving system of claim 6 wherein the signal generating source communicates with the light projecting device by wireless communication.

8. The light projecting and receiving system of claim 7 wherein the wireless communication is by at least one of infrared light and radio frequencies.

9. The light projecting and receiving system of claim 1 further including a signal receiving device wherein the signal receiving device receives signals from the light receiving device.

10. The light projecting and receiving system of claim 6 wherein the signal receiving device communicates with the light receiving device by wireless communication.

11. The light projecting and receiving system of claim 7 wherein the wireless communication is by at least one of infrared light and radio frequencies.

12. The light projecting and receiving system of claim 1 wherein the light receiving device is a video camera for receiving and processing images.

13. The light projecting and receiving system of claim 12 wherein the video camera sends a signal to a recorder for receiving and recording the signal.

14. A mounting apparatus for attachment to a seat in a vehicle comprising:

a) a support member having a first end that is attached to the seat; and

b) a housing to which a light receiving device and a light projecting device can be mounted, the housing attached to a second end of the support member.

15. The mounting apparatus of claim 14 further comprising at least one light receiving device mounted to the housing.

16. The mounting apparatus of claim 14 further comprising at least one light projecting device mounted to the housing.

17. The mounting apparatus of claim 14 further comprising a light receiving device and a light projecting device both mounted to the housing.

18. The mounting apparatus of claim 14 further comprising a vehicle seat to which the support member is attached.

19. A light projecting system for use in a vehicle comprising:

a) a seat; and

b) a light projecting device fixedly attached to the seat.

20. The light projecting system of claim 19 further comprising a mounting apparatus for fixedly attaching the light projecting device to the seat.

21. The light projecting system of claim 19 further comprising a light receiving device fixedly attached to the seat.

22. The light projecting system of claim 21 further comprising a mounting apparatus for fixedly attaching the light projecting device and the light receiving device to the seat.

23. The light projecting system of claim 19 further including a signal generating source wherein the signal generating source transmits signals to the light projecting device.

24. The light projecting system of claim 23 wherein the signal generating source communicates with the light projecting device by wireless communication.

25. The projector mounting system of claim 24 wherein the wireless communication is by at least one of infrared light and radio frequencies.

26. The method of forming a virtual image in the line of sight of a vehicle passenger comprising the steps of:

a) electrically creating a representation of an image;

b) passing light through the representation to create a projected virtual image; and

c) projecting the projected virtual image from a projector mounted to a vehicle seat.

27. The method of forming a virtual image in the line of sight of a vehicle passenger of claim 26 wherein the projector is positioned in an area defined on each side by an extension of a line drawn between an inner portion and a middle portion of each seat back, on the top by a ceiling of a vehicle, and on the bottom by a line drawn between the seats just above where the shoulders of an average passenger in the vehicle would be located if the average passenger were seated in each seat, the area extending in front of and behind the vehicle seats.

28. The method of forming a virtual image in the line of sight of a vehicle passenger of claim 26 wherein the projector is positioned between the vehicle passengers such that the projected image is unobstructed by the passengers in their normal positions.

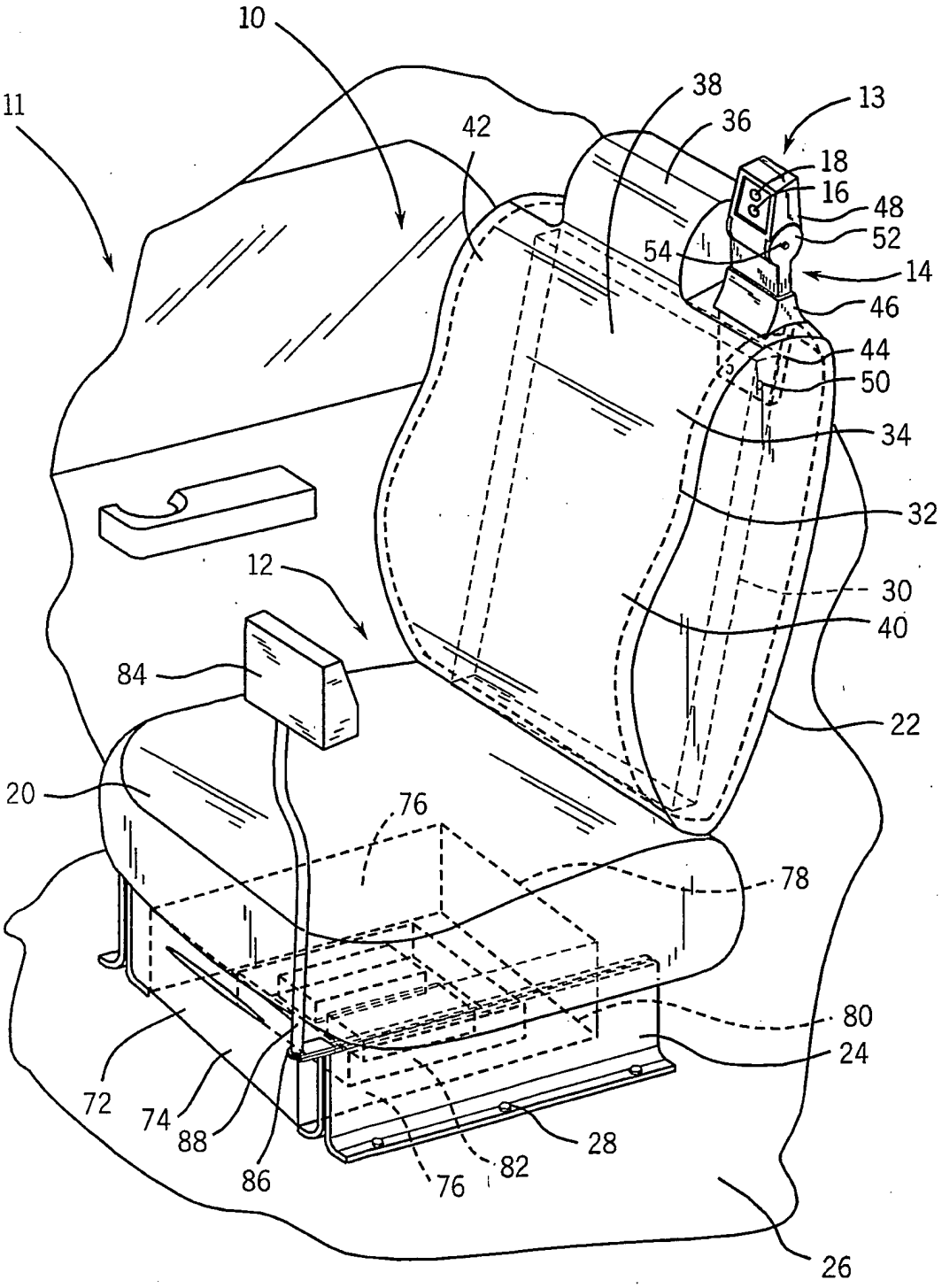
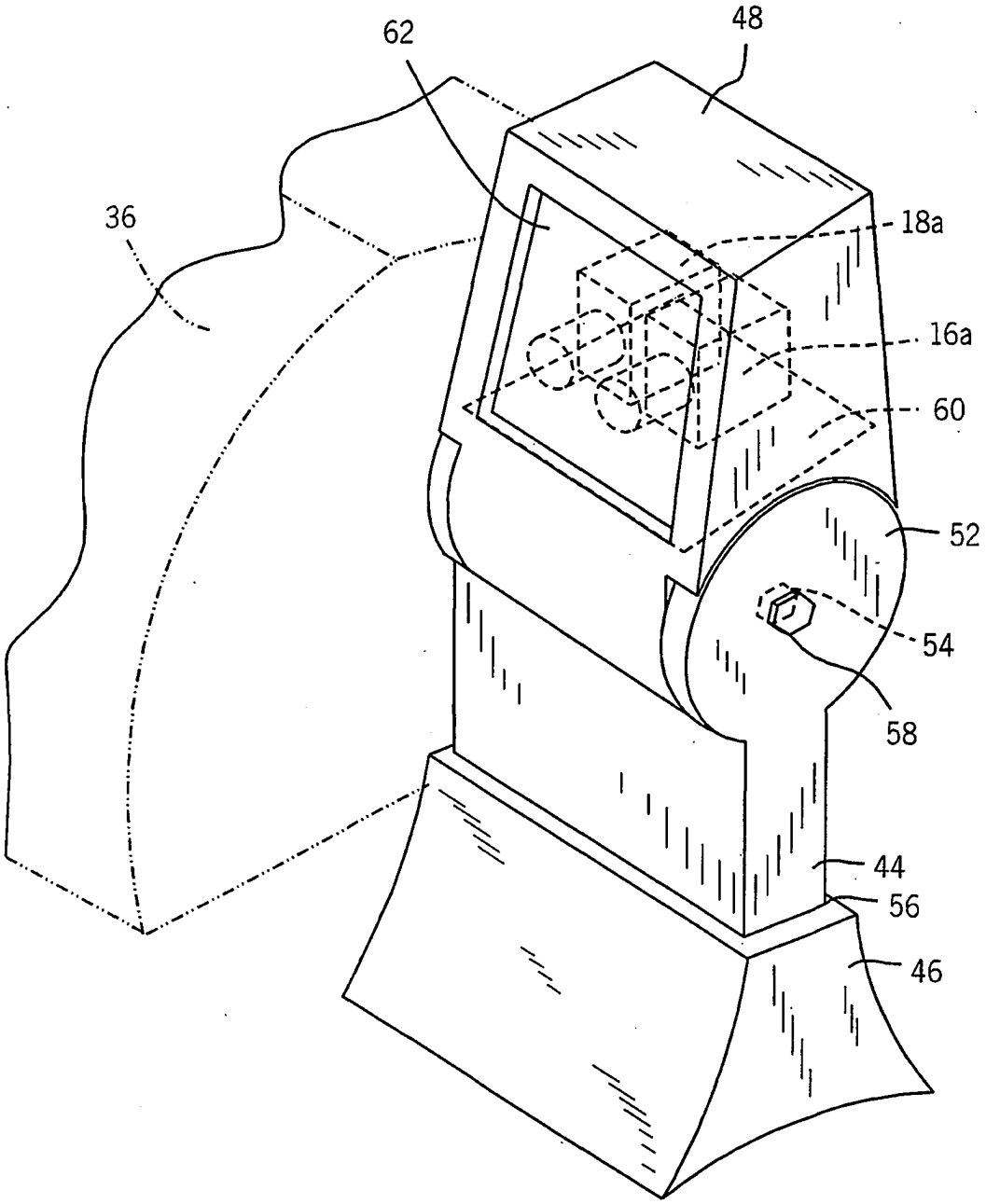


FIG. 1

FIG. 2



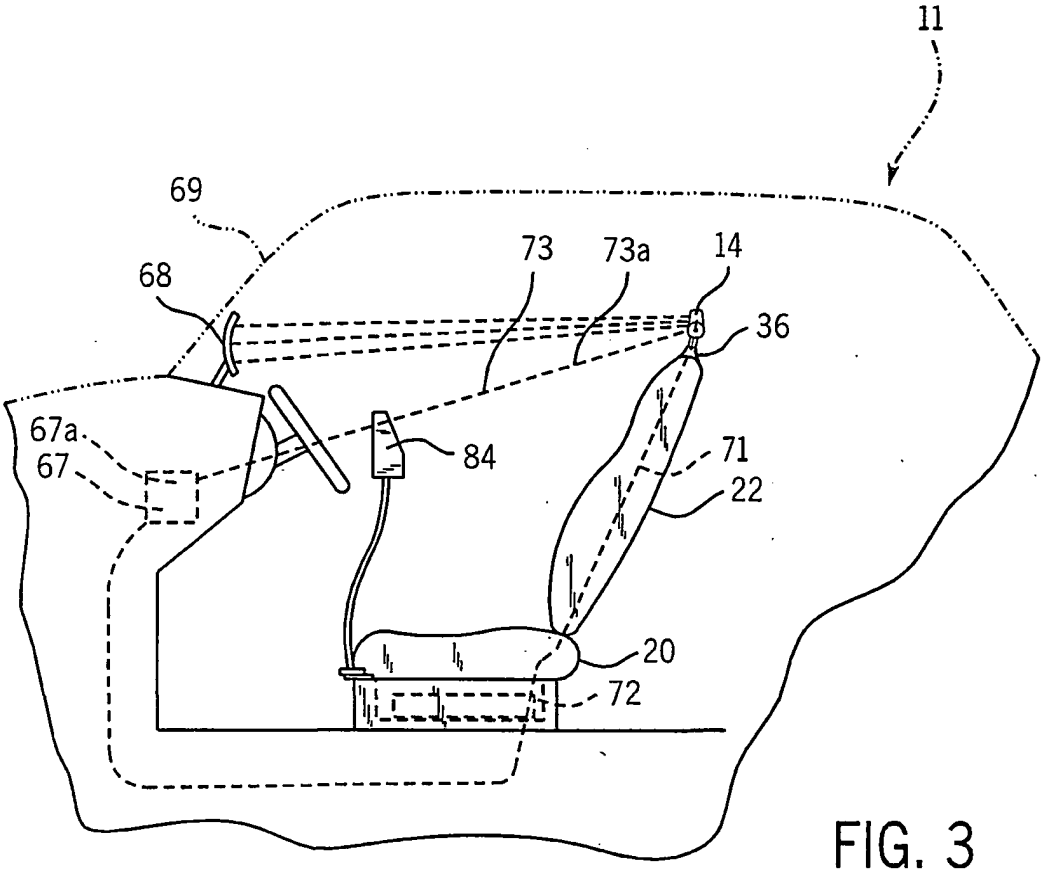

11
69
68
73
73a
14
36
67a
67
84
71
22
20
72

FIG. 3

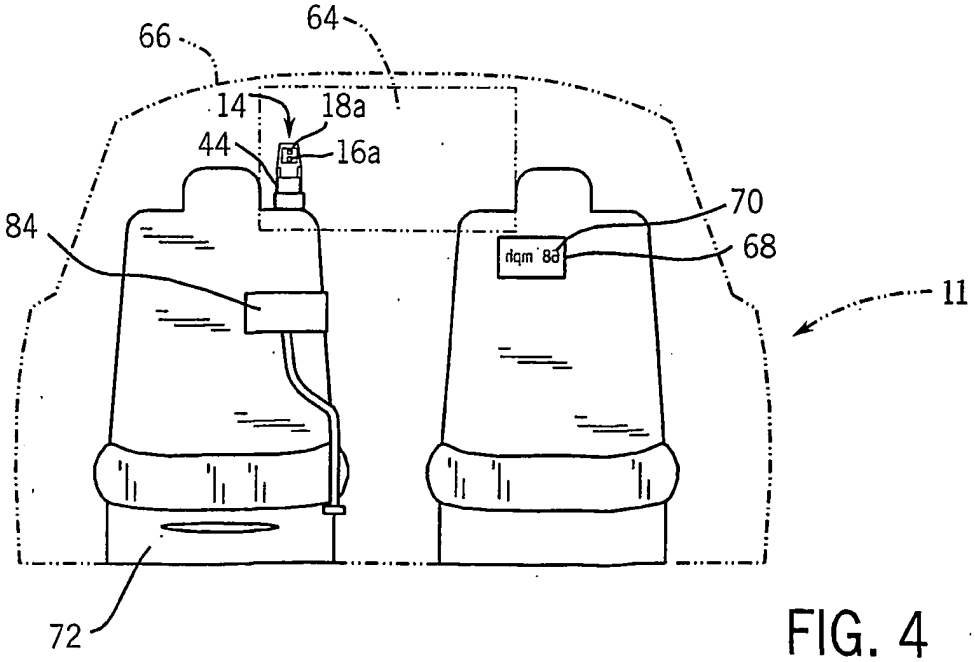

66
64
14
18a
44
16a
84
70
68
11
72

FIG. 4